

What is claimed is:

1 1. A method of performing a switchover of data flows in a multiservice
2 packet based switch from a first data flow to a second redundant data flow without loss of
3 data, said multiservice switch including redundant switching cores, said method
4 comprising the steps of:

5 providing a plurality of ingress and egress communications traffic flow
6 controllers, each of said flow controllers directing one or more threads of said
7 communications traffic over one or another of said redundant switching cores;

8 monitoring communications flow paths traversing said ingress flow controller,
9 one of said redundant switching cores and said egress flow controller;

10 indicating to said egress flow controller an intention to switch at least a portion of
11 said data flows to a path including said another switching core;

12 waiting a given time to cease receipt of packets from said one switching core;

13 receiving an indication to start accepting said data flow from a path traversing
14 said another core; and

15 accepting said data flows from said path traversing said another core.

1 2. The method of Claim 1, wherein one or more virtual output queues (VOQ)
2 exist for a particular ingress flow controller and a particular egress flow controller,
3 switching from said first data flow to said second redundant data flow being
4 accomplished on a per VOQ basis.

1 3. The method of Claim 2, wherein said step of monitoring data flows is
2 accomplished using link test cells generated from a link test generator in said ingress flow
3 controller to a link test cell receiver in said egress flow controller.

1 4. The method of Claim 3, wherein an indication to switch said data flow
2 path is given by an end-of-flow (EOF) test cell.

1 5. The method of Claim 4, wherein said indication to start accepting packets
2 from said another core is given by a start-of-flow (SOF) test cell

1 6. The method of Claim 1, wherein the step of accepting includes the step of
2 altering a filter table in said egress flow controller upon detection of said indication to
3 start accepting said data flow from said another switching core.

1 7. The method of Claim 1, wherein a destination address of a special test cell
2 is directed to a specific flow controller with regard to a unicast switchover.

1 8. The method of Claim 1, wherein special test cells arrive at all leaves of a
2 multicast data transmission, the test cells including a field used to select a particular flow
3 controller address for switchover of said data flow.

1 9. The method of Claim 5, wherein a SOF test cell for a flow controller
2 corresponding to an offline data flow is not scheduled until an EOF test cell has been
3 dequeued from the flow controller corresponding to the online data flow.

1 10. The method of Claim 2, wherein VOQ backpressure is asserted to an
2 ingress flow controller once a valid switchover communication is received regarding a
3 corresponding VOQ, thereby enabling FIFOs in said ingress flow controllers to drain.

1 11. The method of Claim 5, wherein a flow controller for an offline data flow
2 uses an offset counter to detect that a SOF cell is at the head of a VOQ.

1 12. The method of Claim 1, wherein said flow controllers include a function
2 for aggregation of various data flows.

1 13. The method of Claim 13, wherein said flow controllers further include an
2 arbiter function for selection of said data flows.

1 14. A multiservice packet based switch apparatus capable of performing a
2 switchover of data flows from a first data flow to a second redundant data flow without
3 data loss, said apparatus comprising:

4 at least two redundant switching cores; and

a plurality of ingress and egress communications traffic flow controllers coupled to said switching cores, each of said flow controllers directing one or more threads of said communications traffic over one or another of said redundant switching cores;

respective ones of said flow controllers monitoring corresponding communications flow paths traversing said ingress flow controller, one of said redundant switching cores and said egress flow controller;

a test cell generator included in said flow controllers operable to receive a request for a data flow switchover and in response thereto to indicate to said egress flow controller an intention to switch at least a portion of said data flows to a path including said another switching core;

said egress flow controller waiting a given time to cease receipt of packets from said one switching core, wherein an indication is received to start accepting said data flow from a path traversing said another core and said data flows from said path traversing said another core are accepted thereafter.

15. The method of Claim 14, wherein one or more virtual output queues (VOQ) exist for a particular egress flow controller, switching from said first data flow to said second redundant data flow being accomplished on a per VOQ basis.

16. The method of Claim 15, wherein monitoring of data flows is accomplished using link test cells generated from said link test generator in said ingress flow controller to a link test cell receiver in said egress flow controller.

17. The method of Claim 16, wherein said indication to switch said data flow path is given by an end-of-flow (EOF) test cell.

18. The method of Claim 17, wherein said indication to start accepting packets from said another core is given by a start-of-flow (SOF) test cell

19. The method of Claim 14, wherein said egress flow controller includes a filter table which is altered upon detection of said indication to start accepting said data flow from said another switching core.

1 20. The method of Claim 14, wherein a destination address of a special test
2 cell is directed to a specific flow controller with regard to a unicast switchover.

1 21. The method of Claim 14, wherein special test cells arrive at all leaves of a
2 multicast data transmission, the test cells including a field used to select a particular flow
3 controller address for switchover of said data flow.

1 22. The method of Claim 18, wherein a SOF test cell for a flow controller
2 corresponding to an offline data flow is not scheduled until an EOF test cell has been
3 dequeued from the flow controller corresponding to the online data flow.

1 23. The method of Claim 15, wherein VOQ backpressure is asserted to an
2 ingress flow controller once a valid switchover communication is received regarding a
3 corresponding VOQ, thereby enabling FIFOs in said ingress flow controllers to drain.

1 24. The method of Claim 18, wherein a flow controller for an offline data flow
2 includes an offset counter to detect that a SOF cell is at the head of VOQ.

1 25. The method of Claim 14, wherein said flow controllers include a function
2 for aggregation of various data flows.

1 26. The method of Claim 23, wherein said flow controllers further include an
2 arbiter function for selection of said data flows.

1 27. A multiservice packet based switch apparatus capable of performing a
2 switchover of data flows from a first data flow to a second redundant data flow without
3 loss of data, said apparatus comprising:

4 at least two redundant switching cores; and

5 a plurality of arbiter and aggregator devices coupled to either side of said
6 switching cores, wherein during said switchover an ingress arbiter device in line with
7 data flows proceeding to at least two corresponding aggregators inserts an end of flow
8 indication to the corresponding aggregators causing each data flow of a selected virtual
9 output queue to stop,

10 a first aggregator indicating to a second of said aggregators when it has stopped
11 traffic of a particular data flow, wherein said second aggregator after stopping traffic of
12 its data flow notifies a corresponding egress arbiter of said stopping via said end of flow
13 indication, wherein said egress arbiter switches to said second data flow thereafter.

1 28. The apparatus of Claim 27, wherein said egress arbiter switches to said
2 second data flow after receiving an end of flow indication from each of said at least two
3 aggregators.

1 29. The apparatus of Claim 28, wherein said end of flow indication instructs
2 said egress arbiter regarding which of said switching cores to be switched.

1 30. The apparatus of Claim 27, wherein said egress arbiter receives a start of
2 flow indication for restarting said data flows.